

BEST AVAILABLE COPY**10/803,379****In the Specification:**

Please amend page 3 of the specification as follows.

acid washing in order to wire-drawing processing are necessary; and (d) an adhering state of the oxidized scale in the oil temper treatment after wire-drawing is uneven due to unevenness of the lubrication film after acid washing resulting in an undesirable [evil of] forming process [of] for a coil spring [(coiling)].

DISCLOSURE OF THE INVENTION

In view of the aforementioned problem, it is an object of the invention to provide a method for producing an oil temper wire, which will improve quality, achieve reduction in cost, and [simplifying the] simplify steps after [the] scalping.

It is a further object of the invention to provide a method for producing an oil temper wire which is free from decarburization of a wire material and free from [a] damage or unevenness of scale on a surface layer after an oil temper treatment has been carried out, to thereby facilitate forming of a coil spring. For solving the problems noted above, a method for producing an oil temper wire according to the present invention comprises: applying an isothermal transformation heat treatment to a wire material having a nonmetallic inclusion controlled; applying a lubrication film after acid washing; and carrying out scalping or shaving of the wire material [after which softening]. Subsequently, a work hardened layer [lyer] produced

BEST AVAILABLE COPY

10/803,379

[on a surface layer] at the time of scalping is softened by annealing and [carrying out wire drawing, and then carrying out] after which an oil temper treatment is performed.

OPERATION OF THE INVENTION

The present inventor has found that in a method for producing an oil temper wire using a coil spring, to carry out annealing after scalping or shaving of a wire material having a nonmetallic inclusion controlled is effective for a thereafter wire drawing process. That is, the method for producing an oil temper wire for use in a coil spring resides in that a work

BEST AVAILABLE COPY**10/803,379****In the Specification:**

Please amend page 4 of the Specification as follows:

5 hardened layer produced on a surface layer of a wire material during scalping of a wire material is softened by annealing to thereby [remove] eliminate an undesirable result [evil and] after which wire drawing, and [an] oil temper [treatment is] treatments are carried out. Considering a wire drawing workability and a solid solution state of cementite caused by austenite heating at the time of an oil temper treatment after wire drawing process, an annealing temperature of a wire material within a furnace is set to a temperature region from 500 to 650° C. For the atmosphere at the time of annealing, nitrogen or a mixture of nitrogen and oxygen is used, and particularly, the quantity of oxygen is preferably controlled. A control is

10 made such that an oxidized scale film produced by annealing of a wire material is extremely thin and even. Thus, it is possible to omit the conventional lubrication film treatment after acid washing for wire drawing process.

15 A film of an oxidized scale caused by annealing prior to a wire drawing process of a wire material may be subjected to descaling by means of a shot blast or the like. By making an oxidized scale film due to annealing of the material wire even, the thickness of the oxidized scale after succeeding oil temper process becomes even,

BEST AVAILABLE COPY**10/803,379**

and lubricating property at the time of forming process (coiling) of a coil spring can be maintained.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a photograph showing a surface crack of one wire material according to the method for producing an oil temper wire according to the present invention; FIG. 2 is a photograph showing a solid solution state of one more material according to the method for producing an oil temper wire; FIG. 3 is a schematic view representative of an evaluation standard in a coil winding state of a wire material according to the method for

BEST AVAILABLE COPY**10/803,379****In the Specification:**

Please amend page 5 of the specification as follows:

producing an oil temper wire; and FIG. 4 is a photograph showing a decarburization state of a comparative wire material.

BEST MODE FOR CARRYING OUT THE INVENTION

[The method for producing an oil temper wire according to the present invention is characterized by removing evils scalping or shaving a wire material, softening a work hardened layer produced by annealing to thereby remove an evil and after wire drawing is carried out carrying out an oil temper treatment.]

According to the present invention, undesirable hard surfaces of a wire material produced during scalping or shaving are eliminated by subsequently annealing the wire to soften the hardened surfaces before drawing and carrying out an acid temper treatment on the wire.

[Embodiment 1]

There were prepared wire materials A to G and H, as oil temper wires, in which an alloy steel inclusion is controlled, comprising carbon 0.57% (hereinafter, % means weight % unless otherwise particularly described clearly), silicone 1.45%, manganese 0.69%, phosphor 0.014%, sulfur 0.004%, chromium 0.67% and iron (the reminder) and a comparative material H. These materials were subjected to an

BEST AVAILABLE COPY**10/803,379**

isothermal transformation treatment, applying a lubrication film after acid washing, and scalping or shaving of the surface. The scalping amount of a wire material is 0.3 mm in diameter (thickness 0.15 mm). Then, annealing of a wire material by batch was carried out in an [atmosphere] atmosphere of mixed nitrogen and [oxygen] oxygen. An annealing temperature of a wire material was varied from 480 to 700°C to confirm workability of drawing of the wire materials A to G and the comparative material H at respective annealing temperatures. The state of the oxidized scale film after annealing of the wire material was extremely thin and even. Further, the decarburization of the wire materials A to G in annealing was not recognized, but the decarburization in the comparative material H was not recognized, as shown in FIG. 4.